The Qing Formation

in World-Historical Time

Edited by

Lynn A. Struve

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for their unfailing patience, good sense, and cooperativeness, as well as for their technical abilities.

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L.A.S.

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CHAPTER 3

Did Guns Matter? Firearms and the Qing Formation

Nicola Di Cosmo

> The rebel soldiers, positioned at the entrance of the mountain pass, were not ready [for our attack]. As our troops advanced, we could hear the incessant sound of artillery. On the road we came across some shields that had been dropped by our own troops [during the charge]. Carrying a large flag, I ran forward. As we entered the mountain pass, we saw the rebels who, rushing out of the encampment, were lining up abatises, shield-bearing troops, and elephants. Our Green Standard soldiers charged. The fire from cannons and muskets sounded like frying beans, and the earth itself was shaking.
>
> —Dzengšeo 1987: 55

This battle scene is described in the eyewitness account of Dzengšeo, a Manchu officer who served in the Qing army during the war to suppress the Rebellion of the Three Feudatories, which inflamed south-

I am much indebted to Professor John McNeill for his truly valuable comments and advice. I also thank Professor Jerry Bentley for inviting me to present a paper on the subject of this chapter at the Nineteenth International Congress of Historical Sciences, Oslo, 2000. A much abridged and somewhat different version of this essay will be published in the memorial volume of the congress. Finally, I thank the School of Historical Studies of the Institute for Advanced Study (Princeton, NJ) and Harvard University for supporting my research at the Institute during the Spring of 1999.

ern China from 1673 to 1681.[1] In the end the government forces won, ensuring the continuation of Manchu rule. The cannons mentioned in the description of the battle, whether fired from the government or from the rebel side, owed a considerable debt to European military technology, as the war effort was heavily conditioned by the willingness of one Belgian Jesuit, Ferdinand Verbiest, to design and cast "modern" cannon, light and easily transportable, which could be deployed in the rugged terrain of southwestern China to bombard the mountain strongholds of the rebel forces.

By the 1670s the extensive use of firearms and artillery pieces was nothing new in China, and the story of the transmission of European military technology to China is fairly well known in its main lines (Needham 1986; Wang Ling 1947; Goodrich and Feng 1946).[2] Less is known about the actual use of artillery in the context of the Manchus' invasion of the Liao region after 1618, their conquest of Ming China starting in 1644, and the final consolidation of their rule.

What role, if any, did firearms play in the rise of the Manchus to historical prominence? The thesis that advances in military technology had a deep impact on the societies that promoted them in the early-modern period is shared by several historians. Although important aspects of this thesis continue to be debated vigorously,[3] the idea that in early-modern Europe deep changes in military technology altered traditional relationships between army and state and between war and society, thus contributing to the formation of a widening gulf between Europe and the rest of the world, has become widely accepted in the specialized literature and has even expanded beyond the traditional sphere of Western Europe (McNeill 1989; Cipolla 1970). For instance, Carol Belkin Stevens attributes radical political and social changes in early-modern Russia to a "military revolution" born of the specific needs of soldiering in the steppes of southern Russia—a military revolution that was based mostly on logistical requirements and provisioning patterns and therefore differed substantially from the "dominant European model" (Stevens 1995: 159).

1. On Dzengšeo's memoir, see Lynn Struve's contribution to this volume, p. 342.

2. The basic literature includes Roberts 1956; Parker 1988; Downing 1992; Cook 1994; Parrott 1985; and Rogers 1993.

3. For arguments against the military-revolution thesis, see, e.g., Black 1991.

From a world-historical point of view, the military revolution thesis (in all its variants) presents some points of interest not only in connection with its aspiration to explain the "rise of the West" vis-à-vis regions outside Europe but also in regard to the diffusion, trade, and manufacture of the new weapons within the network of contacts that linked Europe with the rest of the world in the sixteenth and seventeenth centuries. Recently, for instance, Victor Lieberman has tangentially entered the debate by regarding certain aspects of the military revolution—such as financial and administrative reforms spurred by the requirements of warfare—as centralizing and integrating forces within a process of gradual convergence, one that fostered greater political integration and economic growth in the early-modern period and unified the Eurasian world (Lieberman 1999: 72–75). On one hand, the military revolution outside Europe relates to the impact of the West on extra-European societies and patterns of Western dominance in the early colonial period. On the other hand, core concepts of the military revolution thesis have been "imported" into the study of extra-European societies to examine whether military changes, including but not limited to the introduction of firearms, elicited social responses, political changes, and economic reforms tantamount to a "revolution."

European reliance on firearms is generally regarded as an important factor—although the extent of its actual relevance is difficult to estimate—in the establishment and preservation of Western power over colonial enemies. Moreover, the introduction of firearms was highly consequential in several extra-European societies, often altering traditional ways of warfare and trade even among peoples who lacked relatively advanced technological knowledge. In southern and eastern Asia, where firearms were already known and widely used before 1500, the introduction of European military technology did not lead *ipso facto* to the establishment of European military superiority over local rulers. Sixteenth-century Europeans had no illusions that Pizarro's military exploits in America could be replicated in Asia, where armies already relied to a considerable extent on musket and cannon (Parker 1991: 176). But advanced European artillery, being desirable to various Asian potentates, was one of the vehicles of European commercial and political penetration in Asia. Thus, the diffusion of such artillery acted as a catalyst of interests that shaped the relationship between Europeans and "Asians" from the early stages of the establishment of perma-

nent European trading and military bases in Asia. European states as well as individuals used their weaponry skills to the hilt, often coming into conflict among themselves when expert gunners chose to sell their independent (and well-paid) services to Asian rulers against the wishes of the European country they came from.[4] Although this phenomenon is better known in South and Southeast Asia, East Asia was affected in a similar fashion. For instance, in the early seventeenth century the Koreans developed artillery by employing shipwrecked Dutchmen as forgers of cannon (Tennant 1996: 181–82), and, as we shall see below, Portuguese artillerymen were sought by the Ming emperors.

Another important aspect of the introduction of advanced firearms in Asia is the effect this had on local societies. Were those effects as consequential as they are assumed to have been in Europe? If so, in what ways? If not, then why not? The best-studied case in this respect is the Japanese adoption, at staggering speed, of various types of Western firearms and their development of battle tactics that suited the possibilities offered by the new weaponry (Brown 1947–48; Morillo 1995). That the Japanese "gave up" the musket for the sword in the seventeenth century (Perrin 1979) is an interesting phenomenon that shows the independent ability of Asian states not only to adopt and produce firearms but also to choose courses of action that suited them. Japanese abandonment of the production of firearms (some of the best made by any standard, according to contemporary accounts) after all did not result in an automatic Western military challenge, nor did it prevent Japan from modernizing its army after 1868. In this respect, too, the Japanese case seems to be at odds with notions of early-modern Eurasian "convergence," as noted by Mary Elizabeth Berry (1999).

Remarkably, China has not yet entered the discussion of a putative military revolution in the early modern period either with respect to Western supremacy or with respect to internal social and political transformations. Although the former of these concerns can easily be justified by noting that Ming and early-Qing China did not have to confront any Western military threat, the latter is more difficult to

4. On the European mercenaries, renegades, fugitives, pirates, and others who served Asian principalities in the capacity, whether real or assumed, of artillery expert, see Scammell 1995.

dismiss, considering the marked developments in military technology that took place in China in the sixteenth and seventeenth centuries, accompanied by momentous political and social upheavals. While some scholars, most notably Joseph Needham, have traced and documented the contacts between China and Europe in connection with the introduction of Western-style firearms, especially in the late sixteenth and seventeenth centuries, this phenomenon has not been analyzed in connection with the single overarching event in the social and political history of seventeenth-century China, the "Ming-Qing transition." While military historians have recognized that the Manchu conquest, from the military viewpoint, presents a more complex picture than the standard representation of a "barbarian" challenge to a critically mismanaged "civilization," and while the Manchu ability to borrow firepower and copy military technology has been acknowledged as one of the factors that must be considered within the broader context of the Qing conquest (Black 1998: 82), the process by which the Manchus adopted new and, to them, unfamiliar weapons is not altogether clear. Consequently the extent, implications, and relative importance of military innovations to the history of the conquest are difficult to assess.

Naturally there are many factors that need to be accounted for when we examine such a macroscopic event, but let us pause to consider the major phases of the Manchu conquest. First, a Manchurian tribe known as the Jianzhou Jurchen, under a certain chieftain, Nurhaci (the future Qing Taizu), established a power base and an independent kingdom (more precisely, a khanate) in Manchuria (by 1616). Then, allied with certain tribes of the Eastern Mongols, they invaded China proper (most significantly in 1644), proceeded to conquer all the former Ming territory (by 1662), and finally expanded into formerly independent frontier regions. Altogether the process took almost two hundred years, from the rise of Nurhaci in the 1580s to the conquest of the Northwest in 1760. The role of the military in this long process can hardly be ignored, and it takes on particular import when we focus on the early period, when Nurhaci's small tribal kingdom began its struggle with the far more powerful Ming empire. It was during the early phase of the rise of the Jurchens-cum-Manchus that some of the most radical changes took place: a new "conquest elite" was forged, inclusive of Mongol and Chinese elements, and the Manchus acquired military skills essential to their survival and final

triumph.[5] The 25 years from the defeat inflicted by Nurhaci on the Ming at Mt. Sarhū (1619) to the victorious entry of Banner troops to the Ming capital were rife with dramatic transformations that largely stemmed from the Manchus' military competition with China. As the Manchus strove to develop greater military efficiency and a wider range of skills and military tools, their society and political system changed. Those changes, ranging from the institution of the Eight Banner system to the makeup of the Qing government, are not the primary subjects of discussion here. The present focus is on the extent to which the Manchu-Chinese military confrontation, and more generally the way in which warfare between China and the northern frontier peoples came to be fought in the early seventeenth century, were affected by the introduction of European-style military technology. If this phenomenon actually played a role in changing the balance of power between the Manchus and the Ming dynasty, then one might be in a better position to understand one of the key aspects of the "cataclysmic" events that transformed China in the midseventeenth century and catapulted the Manchus to a place of great historical prominence: warfare.

While the main lines of the military aspect of the Manchu conquest are known, the specific military factors in the Ming-Manchu confrontation are still something of an analytical blind spot, especially regarding their connections with social, political, and economic changes. Too much emphasis is often placed on the "natural qualities" of the Manchus as superior warriors to explain their success. To a certain extent this has clouded the role played by military technology, as well as the Manchu assimilation and adaptation of new military capabilities, in the conquest of China. One issue that surely deserves greater attention is the introduction of large numbers of firearms in the confrontation between the "sedentary" Ming army and the cavalry forces that constituted virtually the whole army of Nurhaci's recently established Jin dynasty in 1616. Contrary to the common assumption that the power of the gun annulled the military superiority of cavalry-based

5. Nurhaci belonged to the Jianzhou tribal confederation of the Jurchen people. "Manchu" was substituted for "Jurchen" in referring to the native people of Manchuria by his successor's imperial decree in 1635. For the sake of convenience, I use the term "Manchu" to refer also to the people of Manchuria before 1635, even though, strictly speaking, this is anachronistic.

armies—a characterization which applies, if at all, only in the eighteenth and nineteenth centuries—the early Manchu army successfully adopted and developed the new technology. Whether changes resulting directly from the need to adapt to a new concept of warfare shaped Manchu society (in particular its political elite), and whether the same changes dramatically affected the Manchu ability to outperform the Ming on the battlefield—these are issues directly relevant to a better understanding of the "Qing formation." In this essay I shall attempt to bring to the surface several connections among the diffusion of advanced firearms to China, the Ming struggle against the Manchus and the consequent secondary diffusion to them, the Manchu conquest of China, and the European involvement in all these matters. Then I shall proceed to discuss these matters from the point of view of world-historical concerns related to the role of Europeans in Asia and of firearms in the rise of the West.

I shall begin by summarizing the key developments in military technology transfer since the thirteenth century. Then I shall examine the effectiveness of firearms in the frontier warfare between Manchus and Chinese, as well as ways in which the Manchus moved toward the development of artillery capabilities and military tactics in response to the extensive use of firepower by the enemy. In all these contexts, the presence of Western military advisors, technicians, and engineers appears central and ancillary at the same time: central because without them the level of firearm technology achieved in China between 1600 and 1690 would have been either unattainable or achieved only much later; ancillary because it was the adaptation of technology to the specific needs of Chinese warfare, based on decisions made by Chinese officials, which made the adoption of such technology and its further development possible at all. The resulting picture is one that defies any hard and fast judgment about the importance of military technology in early contacts between Europe and China. A supposed Western military superiority remains both untested on evidential grounds and purely speculative even in theoretical terms, as military superiority is based only partly on technology. It requires a full assessment of the context of war, together with an analysis of the fighting parties' ability to mobilize, supply, and coordinate the movements of large numbers of soldiers.

Rather than try to evaluate the effects of the introduction of firearms in China against the benchmark of the European experience, I

shall focus on the actual circumstances that led to the introduction of Western military technology in China, its uses, and its relevance within the context of the Manchu conquest. While explanation of the Ming-Qing transition cannot be reduced to a single factor, this particular one, especially in view of the ideas generated by the broader debate on the military revolution, requires a more accurate assessment than it has received so far. In attempting such an assessment I first examine the circumstances of the use of firearms in China in the sixteenth century, in particular its modes of use on the northern frontier. Then I examine the use of firearms in the specific context of early Ming-Manchu hostilities, in particular from the battle of Mt. Sarhū to the battle of Ningyuan (1626). The third part of the essay examines Hong Taiji's efforts to acquire functional artillery and rationalize the firearm capabilities of the Banners between 1626 and 1643. In this section of the essay I also summarize the main uses of firearms during the Rebellion of the Three Feudatories and the contribution of Verbiest to the further modernization of Qing artillery. Finally, I attempt to analyze the effects of the introduction of firearms, especially Western-style cannon, in the early phase of the Qing challenge and evaluate the apparent consequences of military innovation on the formative processes of the Qing state, especially under Hong Taiji.

The Early Introduction of Advanced Firearms to China

Gunpowder was discovered in China before the ninth century CE. While the exact route through which it found its way to Europe is still uncertain, its transmission, which occurred some time between 1220 and 1245, is to be understood as part of the general flow of people, merchandise, and ideas that accompanied the Mongol conquests. Muslim countries obtained it first, and from there its uses spread north of the Mediterranean. Elementary firearms also were developed early in China and found their way to the Middle East, Europe, and India. Interesting, however, is that while in China gunpowder served a variety of uses, mostly unrelated to war, Western countries seized from the start on its military potential, developing firearms applications far more rapidly than elsewhere and spreading advanced forms of those applications widely by the end of the fifteenth century.

In the fourteenth century, European countries actively sought to introduce the new military technology which had originated in the East. The rising Ottoman empire embraced it fully, too, creating a specialized infantry skilled in the use of firearms and producing huge quantities of artillery pieces and muskets. By no means, however, were attitudes toward firearms uniform in the Muslim world. The Mamluks, whose main strength still resided in cavalry, held to a military ethos strongly reminiscent of their nomadic origins. Hence they tended to resist the use of firearms on the battlefield as something unworthy of a warrior whose qualities shone in the practices of horseback riding, archery, and swordsmanship.[6] Not unlike medieval archers and crossbowmen, whose ability to bring down noblemen at a distance without endangering their own lives brought them the scorn of European knights, harquebusiers and cannoneers were frowned upon as cowardly and unskilled soldiers, whose employment on the battlefield was nothing short of dishonorable. The Mamluks' reluctance to develop firearms, except for siege warfare, helps account for their final defeat in 1517 and incorporation by an Ottoman army well stocked with a large arsenal of firearms (Ayalon 1956: 86–108).

With or without ethical misgivings, political and military leaders eventually appreciated the usefulness of artillery not only in Europe, where the development of siege warfare required the use of powerful wall-breaching cannon, but also elsewhere in the world. Portuguese vessels sailing in South Asian waters were confronted with kingdoms that had already obtained firearms through the "Muslim network," mostly from the Ottomans (Özbaran 1988). The Ottoman empire clearly had a vested interest in fighting Christian political and commercial penetration in Asia, and the delivery of cannons and cannoneers to Asian states (especially Muslim ones) was considered both politically expedient and religiously meritorious. The khanates of Turkestan, the Crimean Khanate, the Gujeratis in India, the Sultan of Aceh in Sumatra, and the Amir of Harrar, Ahmad Grañ, who ravaged Abyssinia from 1528 to 1540, were all recipients of Ottoman weaponry (Inalcik 1975: 202–6; Reid 1969: 396–97). In early sixteenth-century

6. The Turks were also of Central Asian origin, but their cavalry forces were integrated with Christian captives, the Janissary infantry, which gradually became the core of the army. These troops were the ones to which firearms were entrusted.

battles against the Portuguese on the Red Sea and off the Yemenite coast, both Mamluks and Arabs fought with Ottoman firearms. After Ottoman rule expanded to Egypt and Yemen (in 1517), the Ottoman-Portuguese competition continued in the Indian Ocean, and *Rumi* (i.e., Ottoman) firearms found their way to the Mughal empire. The problem was that Ottoman assistance to Muslim brethren was not at all regular. It could be reduced or interrupted by several factors, in particular, the Ottoman reluctance to sustain the heavy financial burden of carrying on naval competition with Europeans on the Indian Ocean, and misgivings among local rulers about the possible costs of Ottoman military and political penetration.

In India the early appearance of musket and cannon, a much-debated topic, can be dated only to the midfifteenth century. Before then, gunpowder, having been introduced by the Mongols in the late fourteenth century (Khan 1996*a* and 1996*b*), certainly had military applications, especially in the production of explosive and pyrotechnic devices, but there is no clear evidence of its use in firearms. Cannon and musket were introduced some time in the first half of the fifteenth century, initially to Kashmir and northern India (Khan 1981), and, while scholars are not explicit about their origin, the route strongly suggests that they came to India across Central Asia through the Islamic ecumene. In the sixteenth and seventeenth centuries, India received European firearm technology, and its principalities and kingdoms developed artillery forces often manned by foreign gunners. Military exchanges were not one-sided, however, as India's integration into the Eurasian network of military trade also included the Europeans' importation of Indian saltpeter to feed their growing munitions industry (Babu 1995: 265).

As transmitters of military technology, the Ottomans were central to the military history of Asia, even though the arms they exported, in terms of both the types and methods by which they were produced, were soon to fall behind European-made guns. Since the uneven quality of the metal and the lack of standards in training and production detracted from the combat value of Turkish weaponry, European-made guns were preferred by Asian rulers. Whether they were obtained by purchase or by salvage from shipwrecks, Portuguese and Dutch cannons were not uncommon in the hands of rulers in Southeast Asia (Boxer 1965), and the skills of Europeans who could make and use guns were highly prized. The flow of Western military technology to Asian countries resembles more a delta of many rivulets than a single stream. Chance findings of artillery pieces, the capture of European military experts, or the decisions of mercenaries with the right skills to seek high-paying employment at the court of a ruler—these occurrences often rendered moot both the papal prohibitions against selling firearms to Muslims and whatever qualms the Portuguese and Dutch governments may have had about selling advanced weapons to potential enemies.

In China under the Mongols (i.e., during the Yuan dynasty, 1271–1368) and in the early Ming period, firearm technology continued to develop independently, but those advances were outstripped by the progress made in European military technology during the fourteenth and fifteenth centuries. The transmission of advanced European firearms to China dates from the early sixteenth century and seems to have followed a meandering and haphazard route. The first officially attested "European" weapons to appear in China were the Portuguese breechloading culverins presented at the Ming court in 1522. Called *folangji* (usually interpreted as meaning "Frankish machines"), their use against the Mongols was advocated in 1530 by Wang Hong. These small cannons, however, were not the first to reach China; there is evidence that the Chinese were already making a similar cannon before 1522. In the southeastern province of Fujian the presence of a *folangji* is documented as early as 1510, that is, even before the Portuguese reached Melaka in 1511. Therefore it is possible that cannons known as *folangji* reached China through a separate route. According to Pelliot, the Chinese term *folangji* may have rendered not "Franks" but the Turkish term *farangi*, which the Moghul emperor Babur used shortly after 1500 to refer to that kind of European cannon. Therefore, a cannon by that name may have reached China through anonymous carriers, possibly from Malaya, before the Portuguese themselves arrived (Pelliot 1948: 199–207). There is also some evidence that during a rebellion against the Ming in 1513 the Muslim principalities of Hami and Turfan used Ottoman (*Rumi*) muskets. Thus, one cannot lightly dismiss the possibility that the old Silk Road played an important role in the transmission of firearm technology to China, especially since, during the first half of the sixteenth century, there were several Ottoman diplomatic missions to the Chinese court. By the end of the sixteenth century, Ottoman muskets had been copied and described in detail in Chinese military literature (Needham 1986: 441–49). Whether

by sea or by land, the Ottoman empire seems to have played a role in the diffusion of advanced firearms to China.[7]

In the sixteenth century the Ming began to deploy firearms consistently on the northern frontier, along the Great Wall, to bolster their defenses against the Mongols, but the actual effectiveness of firepower against nomads at that time is questionable. Qi Jiguang (1528–88), perhaps the most brilliant Ming general and strategist of the time, devised a way of using *folangji* cannons mounted on two-wheeled carts which worked as mobile artillery platforms. These "battle wagons" also had protective screens which were raised as battles started. Twenty soldiers were assigned to each battle wagon, ten of whom were in charge of the artillery pieces placed on the wagon, while the other ten—four armed with muskets—stayed on foot near the wagon. Tactically, the wagons were lined up next to one another to defend the army against cavalry charges. Heavier artillery pieces could also be used, such as the "generalissimo" cannon which weighed more than 1,300 pounds, but those were often too cumbersome to be effective. The combined action of infantry and artillery conceived by Qi to counter Mongol cavalry assaults was never put into practice because the Mongol tribes bordering on the territory under Qi's military jurisdiction reached a diplomatic agreement with the Ming court that brought hostilities to a halt (Huang 1981*a*: 179–81). Interesting to note, however, is that the concept of the battle wagon, that is, a heavy wagon with cannon and arquebuses mounted on it, and of chaining wagons together to form a barrier around the army, was in use among the Ottomans in the fifteenth century, and that by the sixteenth century this had been adopted by Babur via Turkish specialists in his employment (Inalcik 1975: 204). Was the battle wagon developed by Qi Jiguang also based on a Western Asian prototype? At present this question cannot be answered, but the similarities raise doubts about the originality of Qi's tactical invention.

Finally, we should consider the development of firearms in Japan and their influence on China. Qi Jiguang, who also was involved for years in protecting the southern Chinese coastal areas from the attacks of Japanese pirates, states in his writings that the Japanese introduced the fowling piece (Ch. *niaochong*) to China in the midsixteenth century (Huang 1981*a*: 165; Needham 1986: 429). This Japanese musket was made by copying Portuguese matchlocks, but soon Japanese gunmakers attained a high level of proficiency. Moreover, the Japanese adoption of firearm tactics in battle—the volley and the use of regular units of musketeers were already practiced in the sixteenth century—may also have contributed to the wider indigenous use of these weapons in East Asia. Therefore, even though the earliest muskets may have been of Turkish origin, there is no doubt that the Japanese attacks along the southern coast of China and other forms of contact between the two countries also contributed to the circulation of muskets.

7. On the firearms of the Ottomans and their mode of employment, see Murphey 1999: esp. 14–15, 110–11.

From these preliminary notes we can see that the transmission of firearms to China followed multiple routes, whose departure points were western Europe and the Ottoman empire, and that important intermediaries were Japan and probably also Malaya, India, and Central Asia. Therefore, the diffusion of firearms in Asia cannot be understood as the linear outcome of increased European mobility resulting from their progress in oceanic navigation. In order to model correctly the spread of advanced military technology in the fifteenth and sixteenth centuries, it is necessary to take into due account the parallel continental diffusion that was taking place across Muslim territories, as well as the genuine contribution that China and Japan made, early on, toward the improvement of firearms, both technically and tactically.

Another observation concerns the specific use that firearms were intended for in the sixteenth century. While the efficacy of muskets was criticized in the fight against Japanese pirates in southern China, their use continued to be advocated by Chinese strategists for the defense of the northern frontier against Mongol incursions. Besides the aforementioned Wang Hong and Qi Jiguang, in 1541 the governor-general of Shaansi, Liu Tianhe, recommended that towers on the frontier be equipped with firearms (Serruys 1982: 32). Although the Ming government was often unresponsive or inefficient in dealing with such requests, the development of fighting towers on the northern frontier proves that the use of several kinds of firearms, from *folangji* to heavier cannon and musket, was appreciated in the defense of static fortifications. In general, however, while firearms may have been useful in frightening Mongol horsemen with their terrifying

noise, they do not seem to have played a major role in the sixteenth-century Ming defense of the northern frontier.[8]

Initial Ineffectiveness of Chinese Artillery Against the Manchus

In 1583 Nurhaci began his political rise by affirming himself as a shrewd commercial operator and a fearless military leader. For 33 years he fought a long sequence of tribal wars, which entailed the construction of a strongly centralized tribal confederation with Nurhaci's clan (the Gioro, later called the Aisin Gioro) at its heart. In 1616 he moved to a new capital, Hetu Ala (Flat Hill), and formally declared the founding of a new dynasty, soon to be named after the Jurchen Jin dynasty (1125–1234) to which he felt he was the political heir. Two years later he pronounced "seven grievances" against the Ming in a political manifesto that was tantamount to an official declaration of war. This act of defiance toward the Ming dynasty, of which he had been a subordinate frontier chieftain until then, finally persuaded the Ming to send a massive expeditionary army to punish Nurhaci and annihilate the Manchu threat on the northeastern frontier.

The opposing armies met in 1619 at Mt. Sarhū, and the ensuing Manchu victory marked the true beginning of the ascent of Manchu power. On the plain at the foot of Mt. Sarhū, today at the bottom of an artificial water reservoir, Nurhaci defeated mixed forces of Chinese, Korean, and recalcitrant Manchurian tribes. Although the Ming army enjoyed superiority in numbers and armaments, the Manchus destroyed it with their rapidity of movement, brilliant tactical maneuvering, and sheer bravery. Chinese and Korean troops carried light firearms and artillery pieces. In particular, a Korean force of 400 cannoneers was sent from P'yongyang with artillery pieces that seem to have been used offensively, mainly to pin down Manchu cavalry in fortified areas and disrupt their movements (von Mende

8. Ian Johnston mentions a few memorials by Ming officials in which the use of firearms was advocated to resist Mongol border raids or increase Ming offensive capabilities against the Mongols (1995: 192, 197, 206). Arthur Waldron does not elaborate on the use of firearms in the Ming defense of the Great Wall (1990: 151).

1996: 115, 121). More commonly, however, guns were deployed defensively in an outer ring external to fortifications—moats, bastions, or palisades—that protected the main body of the Ming infantry. Often they were mounted on battle wagons arrayed in a circle around the troops (Huang 1981*b*: 34). The deployment of artillery on the first line, in front of archers and infantry armed with short-range weapons, had been a well-known tactical use of firearms since Ming operations against the Mongols in the fifteenth century (Gao ed. 1992: II, 376). Firearms, however, were unable to stop the "wild" charges of the ironclad Manchu cavalry. From what can be understood from descriptions of various phases of the Sarhū battle, each Manchu cavalry charge was preceded by a "rain of arrows" shot at the enemy. Since Nurhaci managed to assemble his forces on advantageous ground, either hilltops or forested areas he had previously secured, the Chinese gunners must have resembled sitting ducks under relentless volleys of arrows. Stones also were hurled at them, when possible, from the surrounding hills. Leaving artillery outside the protected ring, thus, made it extremely vulnerable. Moreover, because of the short range at which those guns were effective—a maximum of two to three hundred meters (Murphey 1999: 14)—the cavalry could reach the enemy very quickly: in the words of one eyewitness, the "guns had hardly been fired when the [Manchu] swords had already reached the [Ming soldiers'] necks" (Yan 1983: 190).[9] The rate of fire also must have been rather slow, or in any case not rapid enough to stop a charge. Slowness to fire might have been due to various circumstances. One was the intrinsic laboriousness of early guns. As mentioned above, the culverin—that is, the Western breechloading gun with a movable gunpowder chamber, known in China as the *zimuchong* ("son and mother gun")—had been imported to China in the first half of the sixteenth century (*Kaogu* 1992). Under optimal circumstances, this innovation certainly allowed for a shorter loading time, but the charging and firing operation still required several steps which only experienced soldiers could complete quickly. In Europe the speed of fire depended greatly on drills meant to increase the efficiency of troops, both individually and in teams, and to reduce the probability of mistakes in combat situations (McNeill 1995). On the northeastern frontier, how-

9. The source cited by Yan Chongnian here is the *Chaonu yicuo*. On this work, see Struve 1998: 178.

ever, few people drilled with firearms, a deficiency that was criticized in a memorial to the throne by the Liaodong army-inspecting censor Fang Zhenru (*QRSX*: II, 237–38). The disastrous Ming defeat at Mt. Sarhū shows without question that guns were present in large numbers on the battlefield, but that their use provided little advantage to the Ming troops. Cannons and muskets were often abandoned tc the enemy or misused. Their effectiveness was questionable, their low degrees of precision and penetrating power rousing little apprehension among the Manchus (Huang 1981*b*: 35, 47). Not only were they ineffective defensively, they were also fairly useless offensively, since they were cumbersome to transport on rugged terrain and slowed down the movement of the army. Therefore, Ming tactics meant to bring the force of artillery into play proved ineffective in the context of a campaign that required high mobility and excellent coordination among the four columns into which the Ming army had been divided.

As for the Manchu use of firearms, according to another Korean eyewitness account, the Jin forces fired some artillery shots with Chinese cannons they had captured (von Mende 1996: 123). This may indicate that Nurhaci's army included some people trained in the use of firearms. But even if that was the case, artillery was not significant in securing the Manchu victory, which depended on superior knowledge and use of the topography and on the effectiveness of the "heavy" (ironclad) cavalry in terms of both mobility and impact. This cavalry was a formidable weapon which allowed Nurhaci to break through enemy ranks, sever lines of communication, charge and scatter infantry formations, or pursue and destroy a routed unit. Thanks to its high mobility, Nurhaci almost always managed to confront the divided Ming forces from a position of numerical superiority. For the time being, therefore, the modern weaponry in Ming hands was not making a difference in their confrontation with the Manchus.

After smashing the Ming army at Mt. Sarhū, Nurhaci went on to invade Liaodong, beginning with the attack on Fushun of 1618. This prosperous area, inhabited largely by Chinese agricultural settlers, was going to provide his state with a more solid economic basis. A problem, from the military viewpoint, was that the cities of Liaodong were heavily fortified and had thick ramparts protected with an extensive array of firearms. In his nearly contemporary account of the Manchu conquest, the Jesuit Martino Martini (1614–61) explained the tactics used by the Manchus when storming the city of Liaoyang:

> The City was defended by exceeding many men, who generally were all armed with Musquets: the Tartars had nothing but Scimetars, with Bows and Arrows, which they discharged with strange Dexterity and Art. But because they chiefly feared the musquet bullets, they resolved by a Stratagem to make that unknown Instrument lesse hurtfull to them than their enemies did imagin. For the *Tartarian* King commanded such as made the first on-set, to carry a thick board for their Shield, which was as good to them as a wooden Wall; these men were seconded by other Companies who carried ladders to climb up the Walls; and the Horse came up in the rear. In this manner he set upon the City in foure quarters, and received the discharge of their Musquets against his wooden Wall; Then in a moment the scaling ladders being applied, before they could charge again, they were upon the Walls and entred the City; for such is the quicknesse and nimblenesse of the *Tartars* . . . that in a trice, they either prevail in their designs, or retire and the little skill the *Chinesses* had in the use of the Musquets, was no small hindrance to the warre. For the *Tartars* quicknesse and nimblenesse not giving them time to charge again, being astonished with the sudden inundation of armed men, they presently fled which way soever they could, but being pursued by the swift *Tartarian* Horse, most of them perished in the taking of this great City. (Martini 1655: 258–59)

If we are to believe this, then the Manchu technique consisted in charging behind the protection of wooden screens, then quickly scaling the walls before firearms could be recharged and shot again. Once engaged in hand-to-hand combat, the Manchu soldiers proved to be superior fighters. The Chinese troops, overwhelmed, attempted to flee the city, only to find the Manchu cavalry waiting for them outside the city walls. We should also recall that ever since the beginning of his military rise Nurhaci had devoted much effort to strengthening his conventional weaponry, and that Banner swords, bows, and armor were made of iron and steel not inferior to that of the Chinese. At any rate, it was the Manchu quickness in charging and scaling the walls and the slow rate of Chinese fire that accounted for the victories the Manchus obtained in Liaodong, where several cities fell one after another. Thus, Nurhaci temporarily overcame the disadvantage of having a cavalry army ill-suited to siege warfare.

From an illustration in the *Manzhou shilu* (Fig. 3.1) another observation can be made. It seems that great numbers of firearms were deployed outside the walls of the city rather than inside, again leaving

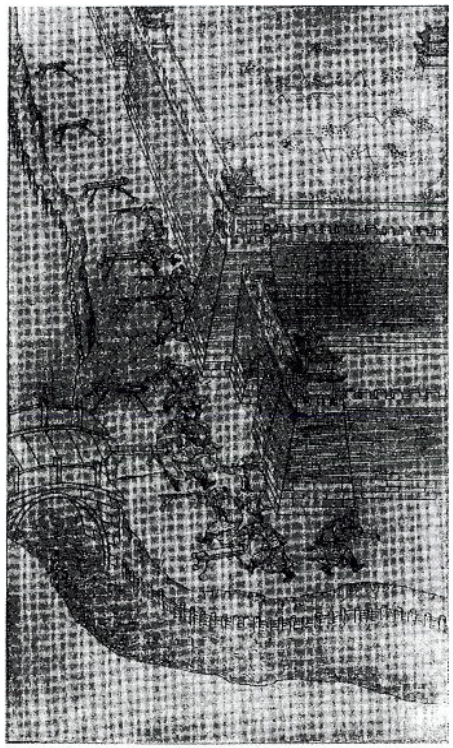

Fig. 3.1 Ming deployment of firearms in defense of Liaoyang (*Manzhou shilu*)

the gunners unprotected against dense showers of arrows. If a number of firearms were disabled almost as the charge started, and if the soldiers on the walls discharged their weapons against the wooden screens, it is no surprise that the Manchus were able to neutralize their effects with relative ease. Here we should recognize a similarity between Ming defensive warfare in the open field, as at Sarhū, and behind city walls, as at Liaoyang. In both cases the guns were deployed external to the protected space, and in both cases the rate of fire was too slow to repel the charge. Likewise, the Manchus relied on one determined "push" to break through enemy defenses and storm the stronghold. In both cases the idea of a proper siege defense does not seem to have been fully grasped, since the defenders were not using the protection of walls to its full potential.

Whether the Manchus used any firearms in the attack on Liaoyang or other Liaodong fortresses is difficult to say. Cannons had been captured in large numbers at Sarhū, and there is no reason to think that Nurhaci would have been inherently disinclined to use them. However, since they were unwieldy, since the Manchu army was still mainly a cavalry force that relied essentially on mobility, and since a proper artillery force had not yet been developed, it is possible that guns were not used in actual siege combat on the Manchu side.

Nevertheless, there is clear evidence that a firearm potential began to be developed in Manchu-controlled Liaodong in 1622 at the latest, as shown in the following decree:

> The Chinese officers in charge of 4,000 people must produce 200 soldiers; ten large firearms (cannon) and 80 long firearms (muskets) must be prepared for 100 of them; the other 100 can be employed as [the officers] wish. Those in charge of 3,000 people must produce 150 soldiers and equip [75 of them] with eight cannons and 54 muskets; the other 75 can be used as wished. Those in charge of 2,000 people must raise 100 soldiers and equip [50 of them] with five cannons and 40 muskets; the other 50 can be used as wished. The Jurchen [i.e., Manchu] officers in charge of 2,700 people must raise 135 soldiers; of them 67 should be made to handle six cannons and 45 muskets; the other 67 can be employed at their discretion. Those [Manchu commanders] in charge of 1,700 people should raise 85 soldiers and distribute four cannons and 36 muskets to 44 of them, while the remaining 41 soldiers can be employed as wished. Those [Manchu commanders] in charge of 1,000 people should raise 50 soldiers, of whom 25 must be equipped with two cannons and 20 muskets, while the other 50 can be used as wished. Those in charge of 500 people should raise 25 soldiers; ten must be equipped with one cannon and eight muskets, the rest may be used as [the leaders] please. (*MBRT*: II, 474-75)

From this edict we can see that a fairly extensive campaign was launched to raise troops armed with guns. This edict refers to the newly conquered population of Liaodong, which had been placed under Chinese commanders who had defected to the Manchus or Manchu commanders who were in charge of the occupied areas. It is quite remarkable that half of the troops recruited from Liaodong were supposed to carry firearms. Allowing a degree of latitude for the computational errors that can be found in the text quoted above, in general

two men were assigned to each cannon, literally "large firearm," which might have been a *zimuchong* or *folangji*, while the muskets, literally "long firearms," of course were individual weapons. According to a Chinese historian, the Manchu term *dagilambi*, which usually means "to prepare," refers in the text above to guns that had been captured from the Chinese and were being *distributed* among the troops (Hu 1986: 49).[10] There is no doubt that the incorporation of Chinese troops in larger numbers after the conquest of Liadong promoted a greater degree of military specialization and therefore ability to exercise more options. In the third month of the seventh year of Tianming (1622), another edict stipulated that in Liaodong one male out of twenty was to serve in the army and, from that month on, was to receive instructions on firing cannon (*MBRT*: II, 571). At any rate, it is uncertain to what extent Nurhaci could invest in the production of firearms. The present consensus is that Manchu troops in the early 1620s, still lacking the capacity to manufacture firearms themselves, were equipped only with advanced firearms and heavy artillery taken from Chinese arsenals in the cities they had conquered. Given the quantity of weapons involved, however, one wonders whether local foundries had not been enlisted in the "preparation" of the firearms with which soldiers were being equipped.

On the Chinese side, efforts were being made to strengthen the defenses of the cities not yet fallen. In this connection the work of European gunners acquires special importance. European intervention in the war against the Manchus was the result of pressures exerted by influential Chinese who had converted to Christianity, and who promoted Western military technology as a means to contain the Manchu threat. In the early 1600s, Ming officials became acquainted with a much larger and more powerful cannon, first brought by the Dutch in 1604 and called by the Chinese "*hongyi* [red(-haired) barbarian] cannon" (Needham 1986: 392). Larger guns of this type were produced by the Portuguese in Macao in foundries operated by Chinese blacksmiths under the direction of European technicians. These cast-bronze cannon, approximately twenty feet in length and 1,800 kilograms in weight, were particularly effective in siege warfare, both offensively and defensively.

10. After the first sentence, I have replaced the literal "prepare guns for soldiers" with "equip soldiers with guns."

Fearing that the Manchus might attack Beijing, Xu Guangqi and Li Zhizao, both Christian converts who had studied with the famed Jesuit Matteo Ricci, persuaded the court to request that Portuguese cannon be sent north. The request was approved, and between 1621 and 1623 several cannons were sent to the capital with Portuguese cannoneers. This move did not go unopposed. For instance, an incident in which a Portuguese and some Chinese gunners were killed by the violent recoil of a piece roused considerable criticism of the foreign weapons. Nevertheless, the Ming side made a sustained effort to outfit their city walls with European guns and more artillery pieces in general. The Ming victory of 1626 against the Manchus at Ningyuan, a city located in a strategic position beyond the Great Wall, is generally attributed to the greater firepower—including *hongyi* cannon—deployed by the commander, Yuan Chonghuan (Li Yingfa 1990: 131; Zhou 1986: 416).

What were the specific technical characteristics and advantages of what was widely respected as a most formidable weapon, and how did this change the balance of power? The *hongyi* cannon is regarded as the first example of an artillery piece made according to scientific principles, that is, by accurate calculation of the ratio between caliber, length, and thickness of the wall. In general, the length of the bore (the interior of the barrel from the loading chamber to the muzzle) was supposed to be twenty times or more greater than the diameter of the bore (caliber). The thickness of the metal at the breech, moreover, had to be greater than at the muzzle in order to sustain the force of the explosion and likewise had to be proportioned to the caliber. Therefore, every element of the gun was made according to fixed proportions of length, width, and thickness. In this way a number of guns of different sizes could be produced. The advantages they offered were longer range, greater precision, and superior destructive power, as some of these guns could be much larger than traditional Chinese ones (Cheng 1993).

At Ningyuan the Manchu army was very large, ranging from an estimated 130,000 troops at the fewest to a maximum, as reported in the sources, of 200,000 (*QRSX*: I, 386). However Manchu armament, still consisting chiefly of swords, bows, and arrows, was inadequate to the task. No matter how brave Nurhaci's soldiers were, better fortifications, more powerful guns, and the advantage of protected firepower prevailed, and after a siege of six days the badly bloodied Manchu troops had to withdraw. Ningyuan shows us that the Chinese com-

manders had clearly learned two lessons in the deployment and use of artillery that revolutionized their defensive siege warfare.

First, following a strategy proposed in 1622 by Sun Yuanhua after the tragic fall of Guangning, the commander at Ningyuan, Yuan Chonghuan, fortified the city with Western cannon.[11] First, artillery was placed inside the fortifications, as can be seen in another illustration from the *Manzhou shilu* (Fig. 3.2). This clearly shows a heavily fortified city wall, with crenellated ramparts from which cannon-mouths can be seen protruding. Explosive devices are being tossed onto the Banner troops attempting to scale or breach the wall, and several wounded Bannermen are being taken away. The general impression is one of powerlessness against superior defenses. Second, the guns used, in particular the deadly *hongyi* cannon, are far more powerful than the guns in Fig. 1 and are wreaking havoc among the assault troops. According to a Korean eyewitness, "As the cannons went off, one could see in the light of the fires the barbarians [*huren*] and their horses being thrown up in the air; those who fell in the confusion were countless, and the villains, being badly defeated, ran away" (as quoted in Zhou 1986: 417).

On the other hand, the Manchus were still relying on their traditional technique of taking the city by a "wave" assault, behind protective wooden screens. But once they arrived below the walls they were impeded by cannon fire, musket fire, "gunpowder pots" (a kind of explosive grenade), mines, and stones (*QRSX*: I, 387). This tactic was extraordinarily costly to Nurhaci, and in the end the huge losses forced him to turn back and abandon the assault. Thus, at Ningyuan the Ming generals—Yuan Chonghuan, Man Gui, and Zu Dashou—had switched to a far more effective defensive strategy, while the Manchus were still relying on older tactics. What really changed the balance of power was the more efficient deployment, better quality, and better handling of the artillery. At this point the Ming had found a way to block the Manchu advance toward Shanhai Pass, and they were ready to develop a counterattack to reconquer Liaodong. For the first time artillery seemed to make a real difference, and, according to Ming sources, the *hongyi* cannon came to be recognized as the chief "heavenly weapon" for "annihilating the barbarians" (Wang Sizhi 1987: 124).

11. On Sun's role in introducing Portuguese artillery against the Manchus, see the excellent study by Huang Yinong (1996).

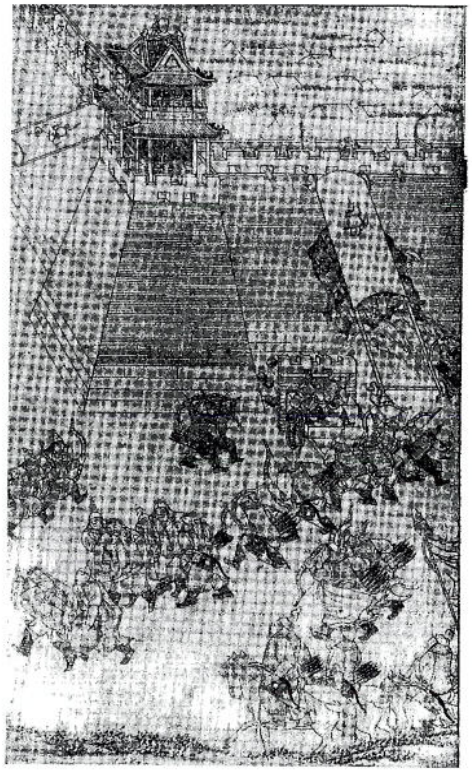

Fig. 3.2 Ningyuan city wall heavily fortified with cannon (*Manzhou shilu*)

On the Manchu side, however, there seems to have been scarce awareness of the actual reasons for their failure to take Ningyuan. In the Manchu records the defeat is attributed to poor performance by the Manchu troops, made lazy or cowardly by inactivity, to substandard equipment—such as short ladders, weak carts, and dull weapons—and even to the khan's own complacency, rather than to the superior firepower of the Chinese defenders (*MBRT*: III, 1068–69). The battle of Ningyuan was followed by yet another defeat, this time suffered by Nurhaci's son and successor, Hong Taiji (1627–1643), at Jinzhou. While the success against the Ming military, especially at Mt. Sarhū, demonstrated the superior ability of the Manchus in field operations, the technologically superior *hongyi* cannon gave the Ming

side both a tactical and a psychological advantage in siege warfare. Once the Ming military learned to position and shoot firearms properly, the Manchus could no longer take the Ming forts by storm and had to withdraw with heavy losses.

The line of fortification external to Shanhai Pass which linked Ningyuan with seven other towns—Jinzhou, Songshan, Dalinghe, Xiaolinghe, Lianshan, Tashan, and Xingshan—was the crux of the Ming defense system against the Manchus, and its effectiveness was essential to preventing the Manchus from penetrating the Wall and entering China. Once that defense line was breached, the Manchus' invasion of China could no longer be effectively prevented. The Ming could hold that defense line as long as they maintained their superiority in defensive siege warfare, which until then had been based on two elements, the exclusive use of European-style large cannon, and the Manchus' reluctance or inability to engage in long-term siege operations.

The battles of Ningyuan and Jinzhou were important for both sides. The Ming leadership renewed its efforts to procure Portuguese cannon, train cannoneers, and thereby strengthen the northeastern defense line. On the other hand, the Manchus changed tactics and began in earnest to develop their own artillery. In effect, the years between 1627 and 1631 can be regarded as key in an arms race that eventually was won by the Manchus. The objectives of that arms race for the Ming military leaders were preservation of their advantage in siege warfare and incrementally increased reliance on large artillery pieces, which they were then using much more effectively than in the previous decade. On the Manchu side, Hong Taiji struggled to acquire the same advanced technology and to develop an army able to mount long sieges. His efforts came to fruition in the siege of Dalinghe, which constitutes a second crucial turning point in the military history of the Manchu conquest.

Ming Efforts to Increase Their Western Artillery Arsenal

At first, the Portuguese were reluctant to lend more guns to the Chinese, since this might weaken the artillery they used in Macao against aggressive Dutch competition, and they did not respond to Chinese requests. But in 1628 the emperor himself requested that ten pieces of artillery and twenty Portuguese cannoneers be sent to the capital. On

November 10 of the same year, seven bronze cannons and three iron cannons were selected. They left Canton on February 28, 1629, but reached the north after the Manchu offensive had already begun, at the end of the same year. The leader of the Portuguese contingent, Manuel Teixeira, and his companions reached the city of Jinzhou,[12] where they mounted eight cannons on its ramparts and successfully repelled Manchu attacks with rapid fire (Teixeira 1976: 198–99). After the Manchus were repulsed, the emperor welcomed Teixeira, Father João Rodriguez, SJ, and the other Portuguese and requested that a contingent of cannoneers be brought from Canton to Beijing to train 10,000 Chinese artillery troops. It was reckoned that a force of about 300 specialists would be sufficient. Thereupon Rodriguez was sent to Macao to raise the force, and at the end of 1630, 160 Portuguese soldiers, 200 Macao residents, and 100 Indians and Africans (obviously, a total number much larger than had been planned) left for the capital, lured by remuneration that is said to have been exorbitant (Boxer 1938). However, partly because the Manchus had already withdrawn and partly because of the machinations of Chinese merchants in Canton, who feared that the emperor might consent, out of gratitude to the Portuguese, to the opening of another trade port, thus damaging the interests of the Chinese commercial lobby in Canton, the force was almost entirely recalled. Teixeira (who had remained in Beijing) and some Portuguese soldiers continued to fight for the Ming, and in 1632 they set up their artillery in Dengzhou under Sun Yuanhua, who had been staunchly promoting the utilization of Portuguese guns against the Manchus. There Teixeira and the other Portuguese artillerymen performed bravely, but all except three were killed in a mutiny of the Chinese garrison.

Although employment of "foreign experts" was not resorted to again until 1642, the use of foreign-style *hongyi* cannon did not abate completely after 1632. In the second half of the 1630s we begin to see, in inscriptions on *hongyi* cannons, the term *juanzhu* (offered casting), indicating that private funds were used to cast some of these pieces. Certain generals who had resolved to fight against the Manchus to the

12. In the Portuguese text this city is identified as Chochow, but I believe this to be Jinzhou, where the Ming commander who actually repelled the Manchus, Zu Dashou, had his headquarters. Zu had already employed foreign artillery in the defense of Ningyuan, where he had fought under Yuan Chonghuan.

bitter end, such as Lu Xiangsheng, undertook to privately manufacture *hongyi* cannon which they attached to their own semiprivate armies. Several *juanzhu* cannons have been found (Cheng 1993). Their private production on the eve of the Manchu invasion, however, also testifies to the great confusion and lack of leadership that afflicted Ming strategic decisions.

In the 1640s the efforts of foreign professional soldiers and scientists to bolster Ming artillery could not prevent the loss of northern China, and even when the fighting moved to southern China, the Portuguese guns did not stop the advance of Qing forces in pursuit of the last remnants of the Ming. Much of the reason for this lies in the Manchus' development of new tactics which, beginning in 1631, annulled the Ming superiority in siege warfare.

Hong Taiji's Artillery: Technology, Organization, and Tactical Uses

Hong Taiji, the son and successor of Nurhaci, is to be given credit for a wide-ranging program of military modernization that focused on both producing firearms and creating a body of specialized troops. Following the defeats or heavy losses suffered by Manchu troops attempting to storm "artillery fortresses," the Manchus acquired the ability to make their first large European-type cannons. These they also called the *hongyi* except that the character for *yi* was changed from "barbarian" to the homophone "coat," since the word barbarian, even if it referred to Europeans in the case of this cannon, was offensive to the Manchus. After having obtained some European-style cannons in the course of a raid that reached the outskirts of Beijing, in 1631 Hong Taiji began the production of this type of heavier gun. This weapon allowed the Manchus to bombard enemy fortifications before storming a city or attacking a walled fort, thus increasing greatly their success rate in sieges and limiting their losses (Zhang 1993; Li Hongbin 1997; Xie 1994). Huge rewards in gold, other valuables, and high military honors were given to soldiers proficient in the use of this cannon. The siege of Dalinghe in 1631 tested the competency achieved by the Manchus in offensive siege warfare and the skills acquired by their army in the use of cannon. By all accounts the test was extremely successful and marked the beginning of a new phase in the conflict; it demonstrated the superiority of the Manchu forces over an entire

range of modes of combat and opened the way to the definite integration of Chinese troops (Hanjun) into the Banners.

The story of the siege of Dalinghe is well known and does not need to be repeated here (Wakeman 1985: I, 170–79) beyond pointing out its main features. We should note that the commander at Dalinghe, Zu Dashou, was a seasoned soldier and experienced military leader; he had served with Yuan Chonghuan at Ningyuan and was no novice at fighting the Manchus. Zu had a veteran army of approximately 14,000 men and large stocks of big and small firearms, *hongyi* cannons, and resources to withstand a siege of moderate length. We should also recall that, until then, the Manchus had shown no desire or ability to mount lengthy sieges, and this may explain why the Chinese preparations proved insufficient for a siege that eventually was prolonged for 80 days. Moreover, the Manchu attack on Dalinghe had been unexpected, and Zu Dashou himself was there by accident, temporarily visiting the city from Jinzhou on an inspection.

First, the Banner army under Hong Taiji effectively created an unbreakable barrier around the fortifications of Dalinghe, so that neither could the occupants break through nor could reinforcements reach it from the outside. Second, they showed great proficiency in the use of cannon, especially larger guns that fired against the small forts or "towers" (*tai*) that surrounded the city of Dalinghe and were meant to protect it. The Manchu siege works consisted of a series of embattlements, including moats and palisades, built on a perimeter of 50 *li* around the city and garrisoned by 45 military camps. The quality of these fortifications attracted the grudging praise of Ming generals who surveyed the battlefield after the fall of the city (Wang Sizhi 1987: 149). After various unsuccessful sallies to break the encirclement, Zu's forces began to despair. The hopelessness of their situation is illustrated by a telling note in the Manchu records: Chinese soldiers who launched an attack from the southern gate of the city were on foot because inside the city cannibalism had begun, and the soldiers had already butchered seven thousand horses for food. These horseless soldiers were defeated, and the Bannermen captured armor, clothing, cannons, and muskets (*MBRT*: V, 552–53). Yet, even though the soldiers resorted to eating human flesh to survive, they did not surrender until word came that the relief army had been routed. The genius of Hong Taiji had been to avoid any frontal attack on a city well defended by resolute troops heavily armed with artillery, to instead en-

gage the enemy in the open field. Both against the forays of the besieged and against the Ming relief armies, the superior mobility and open-field combat skills of the Banners were employed with the usual effectiveness. But this time those traditional skills were further enhanced by artillery, under the command of the Liaodongese Tong Yangxing, one of the earliest and most loyal followers of the Aisin Gioro.[13]

The artillery was especially useful in the systematic destruction of the tower-like forts around Dalinghe. The Manchu records leave no doubt about their effectiveness. Take this passage, for instance:

> [On the thirteenth day,] on the eastern side of the city our Chinese troops [Ma. *nikan cooha*] opened cannon fire against the tower [*tai*]. The tower was entirely destroyed, and the six men on top of the tower died. Then the remaining [Ming] Chinese abandoned the tower, and, forced to flee in the night, they were all killed. One of them who was captured alive [said] that once the people in the tower were hit with the red *canjiang* [lieutenant-colonel] cannon, they were done for. (*MBRT*: V, 539)

Those Chinese soldiers, possibly for the first time, were being exposed to a bombardment against which they seemed to have had no real defense. As soon as they tried to come out, to either fight or flee, the Manchu troops would cut them down. Another record shows that the Manchus could assemble a formidable array of artillery, if they so wished, and that the towers were important "reservoirs" of provisions and weapons that they could use to feed and arm their own troops.

> On that day [sixteenth of the eighth month of 1631], Amba Beile, Jirgalang Taiji, and Erke Cūkur, leading the entire complement of four Banners' *bayara* soldiers, two armored soldiers out of each *niru* of each battalion, and one *amban* from each Banner, took horses and camels to transport one foreign [*hongyi*] cannon and twenty "generalissimo" and "deputy-general" [cannons]. After they proceeded to assault the towers, they encircled them and fired the cannons. The over 100 guns that had surrounded the tower were all fired, and we captured seven camels and 27 horses at the base of the tower. . . . On the night of the seventeenth, 60 Chinese soldiers from within the tower made a resolute and powerful foray, but Quartermaster Lioha defeated them, killing nine men and capturing one alive. Under interrogation, this man reported that when we fired the cannons, [the shots altogether] hit approximately 30 people. We also captured seventeen horses, thirteen cows, and fifteen donkeys. (*MBRT*: V, 546–47).

Several conclusions can be drawn from the performance of the Manchu army at Dalinghe. The first is that the solidity of the siege forced the Ming to confront the Bannermen in open battle and saved the latter from the heavy losses that would have resulted from attempts to storm the city. This strategy fully neutralized the advantage of superior gunfire that the Ming had enjoyed at Ningyuan. As long as the Ming were unable to transfer that advantage to pitched battles and remained unable to break the siege from either the inside or the outside, the fate of even the most formidable defense complex was sealed. The Manchus' strategy surely would not have worked without the development of an artillery force of their own. If cannon had not been successfully employed in reducing the various towers around Dalinghe, the Ming resistance would have been far more formidable, and the Manchus themselves would have run short of supplies. Such a lengthy siege, after all, was a novel exercise for the Manchus, and if their force had been weakened by tough Ming resistance, it is possible that they would not have been able to counter successfully the relief army sent from Jinzhou.

Two crucial innovations took place at this time: the Manchus began to produce their own Western-style cannon, and the Chinese troops in charge of firearms began to form a separate, specially trained corps (Li Yanguang 1992). The earliest troops employed specifically as cannoneers were Chinese organized in a military structure called Hanjun in Chinese (lit., "Chinese military"), which in the 1630s became part of the Eight Banner system. In Manchu the term used for these soldiers is *ujen cooha* (lit., "heavy troops"), which is often assumed to mean troops laden with heavy armaments, and by extension artillery troops. In a letter to the Ming general Zu Dashou requesting that he surrender, Hong Taiji boasted that he had a whole battalion of Chinese gunners ready to attack.

One of the greatest problems of the Ming forces on the northeastern frontier, as pointed out by Frederic Wakeman, Jr., was animus among different commanders, who were divided by regional antagonisms, incompatible professional backgrounds, and divergent individ-

13. Tong Yangxing, like other Tongs of Liaodong, may have been of mixed heritage, both Han and Jurchen. See Wakeman 1985: I, 168, n. 36; Crossley 1983; and Hummel ed. 1943–44: II, 977. Use of the term "Liaodongese" to refer to this social element is adopted from Crossley 1999: 84.

ual views about the war. Many of them had developed relationships of exclusive loyalty with their troops and were hardly distinguishable from local warlords. Hong Taiji exploited such divisions, and it is possible that the creation of specialized, ethnically Chinese artillery forces was meant to attract more defectors from among such commanders, who were shown a suitable military function they could perform with no loss of authority over their men. Significantly, when the Ming renegade commanders Geng Zhongming and Kong Youde pledged allegiance to the Manchu khan, they donated cannons (Wakeman 1985: I, 199) and were allowed to retain intact their own forces. Therefore, the policy of entrusting the care of artillery to Chinese soldiers served at least three purposes. First, the Chinese troops, properly trained, were more effective on the battlefield as gunners than as assault cavalry. Second, the erstwhile Ming officers had more experience with firearms than did the Manchus, and presumably they also could communicate more effectively with the foundry workers and blacksmiths who produced the weapons. Third, the existence of a specialized Hanjun contingent was evidence of the high esteem in which the Manchus held their Chinese military personnel and provided a designated "container" into which the Manchus could put the surrendering and defecting Chinese troops.

The siege method adopted by the Manchus at Dalinghe set a new standard for Manchu-Ming hostilities in the Northeast, as it became the model for later battles, in particular those at Jinzhou and Songshan (1641). In the latter cases, the Ming troops seem to have been better prepared to hold out for a longer period of time, since Zu Dashou resisted in the beleaguered town of Jinzhou for over a year, the Manchu army having once again encircled the city with impregnable fortifications in which were deployed troops and artillery. The difference was that the Banner troops this time had a far more impressive array of firearms, including a large number of "redcoat" cannons, manned by Chinese and Korean artillerymen. In the ensuing siege of both Jinzhou and the nearby fortress of Songshan, two features of the battle emerge even more clearly than at Dalinghe. The sallies by the trapped Ming soldiers were frustrated not only by the Manchu cavalry and fortifications but especially by the artillery fire of the Hanjun forces on the Manchu side (Wakeman 1985: I, 212–16). Once Songshan had fallen and no relief could be expected from that quarter, Zu Dashou surrendered and Jinzhou finally fell to the Manchus (Gao ed. 1992: III, 407–8).

In 1642, in preparation for a massive offensive against the Ming, Hong Taiji set up a new cannon foundry in Jinzhou, where several *hongyi* cannons were cast. The organization of this factory's production represented a serious effort at standardizing the types of ordnance, since precise specifications were established as to the weight and caliber of each cannon, quantity of gunpowder to be used per charge, and type of ammunition. After the conquest of northern China in the early Shunzhi period (1644–1661), another factory was opened in Beijing and placed under the joint responsibility of the Board of War, the Board of Public Works, and the Imperial Workshop (Zaobanchu; Hu 1986). However, while the Manchus contributed to making the production of artillery pieces and firearms more efficient, the guns they produced were still based largely on Ming types, which were themselves modeled on Portuguese and Dutch ones.

Jesuit Guns and the Consolidation of Qing Rule

The next and last phase of the early Qing engagement in military modernization came after the conquest of Ming China had been completed and relied on the scientific expertise of the European Jesuits resident in Beijing. Summoning the Jesuits' knowledge to fabricate new guns was not without precedent. In 1642 when the Ming dynasty was on the verge of collapse, the emperor had ordered Father Adam Schall, the head of the Jesuit mission in China, to use his technical and scientific knowledge to set up a cannon foundry in Beijing. Schall was asked to reduce the size and weight of guns with no loss in their power or range. He reluctantly accepted this charge and in the first year made twenty prototype guns, on which model 500 were produced the following year. During that time, he also wrote a book on artillery titled *Huogong qieyao* (Essentials of gunnery; Needham 1986: 394).

After the conquest of China, the Qing armies attempted to rationalize and centralize both the production and allocation of firearms while continuing to rely on their Hanjun as artillery troops. In that vein, an imperial decree issued in 1673 ordered that each Hanjun Banner should train a battalion of firearm specialists, purportedly because not many Chinese soldiers were suited for cavalry service. At the same time, a process of decentralization unfolding in southern China had reached a critical point, and in that very year Wu Sangui (1612–78) mounted the most serious direct military challenge ever faced by a Manchu ruler be-

fore the nineteenth century. Wu Sangui had been the most prominent Chinese military and political figure in the Qing regime since 1644 when, having served in the field against the Manchus but facing the rebel occupation of the Ming capital, he had opened Shanhai Pass and allowed Qing forces under the Manchu regent Dorgon to occupy Beijing. Under the Qing standard he fought several campaigns against the "usurper" Li Zicheng and then led troops against the Southern Ming.[14] For his merits in this phase of the conquest, he was rewarded with the titles Generalissimo Who Pacifies the West (Pingxi da jiangjun) and Prince Who Pacifies the West (Pingxi wang) and was given the governor-generalship of Yunnan, where he established himself as a regional satrap, still commanding possibly the best-trained Chinese troops in the land. Wu's revolt, which had been prompted by Beijing's decision to accept the retirement and eliminate the fief of Shang Kexi in Guangdong, was soon joined by Shang's disgruntled eldest son, Zhixin, and by Geng Zhongming's son, Geng Jingzhong, who had been appointed the feudatory of Fujian. Thus, Qing control of the far south, southeast, and southwest was imperiled.[15]

The story of this Rebellion of the Three Feudatories is quite well known, as is the fact that the Qing Kangxi emperor sought the help of Ferdinand Verbiest in making different types of cannon more suitable to the conditions under which this war was fought. Verbiest's brief was to make artillery pieces that were light and handy, easy to transport over rugged terrain, while retaining their range of fire and ability to deliver heavy projectiles (Fu 1966: I, 48). Such guns were necessary because some of the rebel strongholds were located on mountains that were difficult to attack with regular troops, and especially because the best Qing forces continued to be Manchu and Mongol cavalry, whose usefulness had been drastically limited by the mountains, jungle-like forests, and rice paddies of southern China. Verbiest, like his predecessor Schall, undertook the work reluctantly but nevertheless was highly successful. Over 500 of a total of about 900 artillery pieces made during the Kangxi reign (1661–1722) were cast under his direction or made on the basis of his designs.

14. On Wu Sangui, see Deng 1987; Haenisch 1913; and Hauer 1927. An insightful appreciation of Wu Sangui's role in the Manchu conquest has been written by Angela Hsi (1975).

15. On this rebellion, the best study in English is the dissertation of Kai-fu Tsao (1965), partially published in 1974–75. See also Chang 1981–82 and Kong 1986.

The first cannon made by Verbiest was the so-called wooden cannon, in which a lighter barrel was reinforced by a cover of painted wood and mounted on a carriage. Trials having been successful, several of these guns were produced and used in the struggle against the feudatories. The main advantage of this gun was its ease of transport, but it remained relatively weak and limited in both range and caliber. These guns must have been produced rather hastily, but they fit the requirements of the situation and possibly encouraged the emperor to continue to invest in making new and better guns.

The most innovative cannons were designed and produced by Verbiest from 1681 onward, that is, after the rebellion had been crushed. The Kangxi emperor's plan was to equip every one of the Eight Banners (presumably the Hanjun divisions thereof) with 40 pieces. Thus he ordered Verbiest to cast 320 cannons. The first series of the new Verbiest cannon, numbering 240, was ready in 1681. This was followed by the casting of other types of cannon, which continued until the death of Verbiest in 1688. These cannons are remarkable for their high degree of precision. From some of the surviving specimens, which bear inscriptions on the breech in Manchu and Chinese, we can see that detailed information was given as to the powder, type and weight of shot, and sighting system to be used. Also indicated are the names of the engineer (Verbiest), the supervisors of the production, the chief craftsman, and the subordinate craftsmen (Stary 1994; Kara 1960).

The most important of Verbiest's cannons were the *shenwei*, the *wucheng yonggu*, and the *shengong*. The first was a light field gun (200 kg) mounted on a two-wheeled carriage; it was effective at a range of 200–300 meters and shot a cannonball of 900 grams. The second type was much more substantial: its weight varied between 2.0 and 3.5 tons, and the cannonball weighed as much as 10 kg. This cannon also was mounted on a wheeled carriage. The *shengong* cannon was mounted on a three-wheeled carriage and was midway in size between the *shenwei* and the *wucheng yonggu*. It weighed about half a ton and delivered a shot of 1.8 kg. Verbiest also designed a type of trench mortar, called the *chongtian pao*, which shot explosive shells on a sharply curved trajectory (Shu 1994). In addition to designing and casting cannon, in 1682 Verbiest wrote an important treatise on the theory and methods of employing artillery, the *Shenwei tushuo* (Illustrated account of the magically awe-inspiring [cannon]), which seems to have been lost, as well as a treatise on sighting. From the latter we can see

that in order to ensure the accuracy of shooting, and to calculate the correct positioning of the sighting devices, Verbiest relied on geometrical calculations (Shu 1994: 241–43).

That artillery was tremendously important in the eight-year-long Qing war against the feudatories is demonstrated by the personal account of the Manchu officer Dzengšeo, quoted at the beginning of this chapter. According to the information provided in his diary, artillery was used by both Qing and rebel forces in large quantities and consisted of both cannon and musket. Cannon was used to bombard enemy fortifications and in one case to level a village where, on the basis of information gathered from local allies, hostile troops were thought to be hiding. Firearms were also invariably deployed in pitched battles, and the Qing charges were met by heavy cannon and musket fire. The mountainous and often inaccessible terrain in the Southwest presented serious logistical problems to an army that was still relying (as we also can see in Dzengšeo's diary) on a large number of horses. The use of lighter artillery in part helped the Qing to dislodge the enemy from well-protected encampments that would have been difficult to reach with cavalry or heavier guns. As to who was actually using these weapons, the diary is unclear. It is almost certain, however, that at this time the only Qing troops charged with using and training in firearms were the *ujen cooha*, that is the Hanjun, who had been incorporated into the structure of the Eight Banners in the 1630s.

A reasonable question would be whether the Green Standard troops (mentioned by Dzengšeo) were at all armed with firearms and whether they played an important role in increasing the artillery potential of the early Qing. The Green Standard army, created from remnants of erstwhile Ming armies during the conquest of China, included a considerable reservoir of firearm specialists, but in the early phase of the dynasty the Green Standard's potential in this respect was not encouraged. Because the Qing leaders did not fully trust former Ming troops, the best firearms were handed to the Eight Banners. Moreover, Green Standard soldiers were discouraged from training as musketeers or cannoneers by a system of promotions that rewarded traditional Inner Asian military skills such as archery and riding (Luo 1984: 382–84). By placing the artillery arsenal under the control of Bannermen and by not promoting former Ming firearm specialists in the Green Standard for their gunnery skills, the Qing leadership in effect reduced the Green Standard to a mainly traditional infantry force.

In Dzengšeo's diary, the Green Standard units actually operated in a variety of situations—as engineers in the building of bridges and fortifications, as assault troops (being often the first to charge the enemy), and as the army's front line in pitched battles—and a Green Standard unit even was explicitly sent to destroy the aforementioned village by cannon fire. It is possible that at this relatively early stage the Qing had not yet begun the process of centralizing the firearm troops, which led to the creation, in 1688, of a new structure called the Office of Firearms and the Saber-Trained Battalion (Huoqi jian lian dadao ying yamen). This office had jurisdiction over all firearms and also managed specially trained assault units. Another step toward greater centralization was taken with the creation of the Firearm Battalion (Huoqi ying) in 1691.

The later history of the development of firearms in China and of their role in the resistance of the Qing to Russian encroachment in the Northeast, in the further expansion of the Qing state in the Northwest, and in the wars that were fought in the Southwest through the eighteenth century, remains outside the scope of this chapter. Recent scholarship has emphasized the logistical sophistication of the Qing army (Perdue 1996: 779) and its ability to fight wars in different terrains. This was surely the case, and it is equally certain that there was no other state in Asia whose power was comparable to that of the Qing. But the Qing do not seem to have acquired the ability to improve their firearm potential or to have established an "industry" that might respond quickly and efficiently to external stimulations. The types of cannon cast by the Jesuits in the midsixteenth century were still used in the Opium War almost two centuries later. In the late eighteenth century the Jesuits still seem to have been involved, regardless of specific papal prohibitions, in assisting China with the manufacture of cannon, but whatever artillery the Qing had at that time remained of inferior quality and did not constitute an advancement over seventeenth-century firearm technology (Waley-Cohen 1993: 1531, 1537–39).[16] The causes of this arrested development deserve pursuit in a separate study.

16. In particular, Western military specialists have noted that Chinese guns found at the Dagu forts included a cannon with the inner part of the bore made of longitudinal bronze rings welded together, while the outer part was made of cast iron. Such guns seem to have been made according to some of the most advanced principles of European technology (except for boring and rifling), but in fact they

The "Military Revolution" and the Qing Formation

The work of Jack Goldstone shows possible links between the Ottoman crisis and the Ming-Qing transition, as these separate political and economic systems responded to similar worldwide changes (1991: 349–90). The new world order that emerges after 1500 has long been attributed to the Europeans' expanded capacity to conduct commerce, to access sources of wealth, and to impose themselves as political, military, and financial brokers in extra-European contexts. Surely this does not mean that Europe overnight came to dominate the rest of the world, but equally surely, the European presence outside Europe modified, sometimes radically, pre-existing equilibria. While the debate on the primacy of Europe in the creation of the "early modern world" continues to rage (e.g., in Frank 1998), and while the notion itself of an early-modern world is put to the test (Goldstone 1998), mapping the historical relationships between newly emergent factors and pre-existing ones is essential to a balanced analysis of major sixteenth- and seventeenth-century events in extra-European contexts.

On the face of things, it was the Ming, not the Qing side, that should have benefited most from the introduction of European military technology in the sixteenth and seventeenth centuries. China had a long familiarity with gunpowder and firearms, and the structure of its army, based as it was on foot infantry, should have been suited to the adoption of European-style artillery and the drills this entailed. Moreover, several strategists and field generals had been advocating and experimenting with firearm uses. Finally, the huge investment in static fortifications in the north, including all the forts, towers, and battlements usually associated with the Great Wall, should have favored the kinds of centralizing processes and the appropriation of resources for military uses that the advocates of military revolution identify as defining characteristics of the European early-modern period. Instead, the outcome of the introduction of firearms in the military context of the Ming-Manchu war turned out entirely differently, as it aided the transformation of the Manchu military, in a short span of time, from an army based on armored mounted archers into an

were not products of Western influence. The period when these guns were made remains unclear, though the Western observers regarded them as "evidently very old" (see Banks 1861). I thank Don Wagner for directing me to this article.

army whose great efficacy in siege warfare depended on a large artillery arsenal that included some of the most advanced technology available anywhere in the world.

The "strong" version of the military-revolution argument would claim that the military competition with Ming China dominated the political choices of the Manchu ruling elite after they declared dynastic status and especially after they went on the offensive in Liaodong. Essential parts of this competition were the modernization of the Manchu arsenal and tactical changes to accommodate the new technology within traditional patterns of Inner Asian warfare. It was *because of* this overarching requirement that the Chinese military personnel recruited in Liaodong were allowed to enter the ranks of the Jin army. Hence, the argument in favor of a Manchu military revolution would claim that the early formation of the Jin-cum-Qing ruling elite, in particular of the Manchu-Han compact, was rooted in the need to modernize the military, especially in the aftermath of the debacle at Ningyuan in 1626. While there is no doubt that the Chinese who were recruited before the crossing of Shanhai Pass were also needed in administrative positions, the first "space" opened to Chinese personnel in the Manchu-Mongol army, and the first tasks that Chinese troops were called to fulfill, were directly related to the employment of firearms.

A further element of this strong version is that, without the fall of Dalinghe, which all military historians attribute to Manchu gunnery and siege skills, the conquest of Ming China would have been much less certain. If the Chinese military had been able to preserve its superiority on the northeastern front line, it is highly unlikely that commanders such as Zu Dashou, Hong Chengchou, or even Wu Sangui would have been persuaded to switch allegiances. The modernization of Banner capabilities, we should also note, did not result in a complete abandonment of previous Jin/Qing methods of warfare. Rather, it complemented them. The Manchu superiority in field operations, where their armored cavalry could not be matched by any Ming unit in terms of mobility or impact, was fully retained. The adoption of firearms added to this traditional strength the ability to lay siege, reduce fortifications, and pin down enemy forces. One of the most important results, for an army that could not count on the huge reservoir of conscripts available (at least on paper) to the Ming, was a very substantial reduction in the number of casualties.

According to this strong version, then, the centralization of government that took place under Hong Taiji could also be seen as a function of the need to direct this military revolution, and to concentrate the leadership of an ever more sophisticated and complex army in the hands of fewer people, bonded by a common vision of what victory required. Hong Taiji's pragmatism and determination were crucial to the completion of a military revolution that included the pursuit of new technology, recruitment of firearm specialists, and forceful curbing of retrograde uses of military force—such as the needless massacre of Yongping perpetrated by Amin (Wakeman 1985: I, 165–66). It was this that eventually turned the Aisin Gioro from leaders of a tribal confederation into rulers of a vast empire.

The less strong, or "moderate" version of the military-revolution argument, on the other hand, would recognize the importance of artillery but would also remind us that the introduction of firearms constitutes only a part of deep social and technological changes associated with the military revolution. The transition to scientific systems of fortification, the introduction of serial drills in military training, and the centralization of resources to be expended in military enterprises are some of the other aspects that would demand consideration. The moderate version of the argument would therefore place less emphasis overall on the issue of military technology in the Manchu conquest. In this vein, Manchu military successes have been attributed positively to their qualities as mounted warriors—bravery, great archery skill, mobility, and so on—or negatively to either the Ming failure to fully modernize as a result of general "crisis" conditions,[17] or to grave divisions among the Ming generals and politicians, whose factionalism, regional rivalries, and centrifugal tendencies made any concerted effort to seek more effective military solutions impossible to realize. The Manchu military success, then, is seen as peripheral and opportunistic, and the acquired ability to use cannon and musket as the result of a policy to co-opt the Chinese northeastern leadership whose military expertise was incidental, or at best secondary, to the administrative expertise they had to offer.

The military history of the Manchu conquest in the over twenty years from Sarhū to Songshan, however, shows that radical transformation of the Manchu army followed a military logic dictated by the ability of the Ming to forestall their advance and frustrate their more traditional methods of warfare. While historians have yet to identify the deeper connections between military innovation and the social and political changes that took place in Manchu society during its preconquest stage, it is clear that the military factor cannot be ignored. In fact, Inner Asian traditional warfare, as embodied in the early Manchu-Mongol army, was forever transformed by the introduction of artillery. Bannermen, although usually brave and highly motivated, were not invincible. Flexibility, the capacity to organize and coordinate different types of soldiers and military expertise, the willingness to utilize a wide range of resources, and reliance on a chain of command unhampered by extreme factionalism seem to have been, in the long run, greater advantages than the "natural" predisposition of the Manchus to wage war. Attacking fortified strongholds defended by cannon and musket was not an everyday experience for either Manchus or Mongols, nor a skill acquired in childhood, and the conquest of southern China, especially, was carried out often on terrain unsuitable to the use of cavalry tactics against seasoned Chinese troops. Without denying Manchu bravery, the story of firearms shows that the success of the Banners, especially under Hong Taiji, rested on their ability to transform themselves into a more complex and adaptable machine. The Banner system had made the whole society function according to the military requirements of war against Ming China, and that system was subject to constant changes and modifications as new Banners were created and new people, from allied Mongols to Chinese turncoats, were incorporated. This flexible organization came to include also the technical resources to manufacture large quantities of advanced weaponry.

By weaving together the destinies of Chinese mandarins, Manchu generals, Portuguese cannoneers, European missionaries, and many other people, the history of firearms also links closely the history of the Manchu conquest of China with broader currents of world history. As new military technology from Holland washed ashore on the coast of China, was reproduced in the Portuguese foundries of Macao, or was designed and realized in Beijing under the direction of German and Belgian scientists, its adoption was by no means a passive process. An analysis of seventeenth-century military technology in China shows that although advances owed much to the involvement of

17. Here, the argument that a "seventeenth-century crisis" inhibited the Ming ability to respond to military challenges should be recalled. See Wakeman 1986.

Europeans, the general development of firearms was driven by internal factors that determined the nature and the aims of the European involvement. This was not automatic diffusion. Advanced arms were developed by adapting European scientific knowledge to the special requirements of current military circumstances and by concrete processes that were predicated on the mature metallurgical capabilities of the Chinese. Ming China, like Japan and other countries that developed a European-influenced military arsenal in the sixteenth and seventeenth centuries, was neither dominated by European gunnery nor internally transformed by it in any indelible or ineluctable way. The impact of European firearms had a deeper effect on the smaller, more fluid, rapidly centralizing Manchu political society in its formative preconquest days.

Regarding the specific issue of the transmission of firearms technology from China to the Manchus, the recent work of Keith Krause on the spread of military technology is useful in that it allows us to identify the processes of diffusion among different types of producers. Krause divides them into three tiers: the first-tier suppliers who innovate at the technological frontiers, the second-tier suppliers who produce weapons at the technological frontier and are able to adapt them to market needs, and finally the third-tier suppliers who reproduce existing technologies but do not capture the underlying processes of innovation or adaptation (Krause 1992: 31; see also Grant 1999: 180–81). China, which led the way in firearm technology until the fourteenth century, was overtaken by other parts of the world in the fifteenth and sixteenth. Then, the country's prospects of benefiting from the new technology available in the broader world "marketplace" rested on its ability to copy the new weapons, produce them in the needed quantities, and adapt them to its tactical and strategic conceptions. The Ming managed to develop some of the standards required to belong to the third-tier producing group, mainly thanks to China's mature metallurgy (Krause 1992: 48). But Ming standards were fairly low and were soon replicated by the Manchus.

Krause argues that although extra-European countries failed to rise above third-tier status, attaining that status nevertheless enabled some of them to establish regional dominance, since surrounding states were not able to reach even that level (1992: 52). While this argument can be accepted for the Ottomans, in light of what has been shown above, it remains problematic regarding China, since the Ming state,

which had achieved third-tier status, in fact lost its regional dominance. Since the divided Ming leadership was not able to fully integrate this technology within its military apparatus and the production of supplies (including guns, ordnance, and gunpowder) remained unreliable, the Manchus were able to "catch up" relatively quickly. The pattern of diffusion here involves essentially two third-tier producing countries, not one. China's inability to control the innovation process effectively allowed the Manchus to join the Ming in the reproduction of European technology as soon as the basic conditions were obtained. These consisted of technical resources and expertise: foundries, artisans, and artillerymen. At an early point Nurhaci had identified advanced military production as key to the survival of his state and had employed a large number of artisans in the workshops of his capital at Hetu Ala.[18]

Thus, the military history of the early Manchu state, examined from the point of view of the adoption of firearms,[19] shows that the Qing formation became part of at least one of the larger global currents that define the early-modern age, even though interpretation of that formation as in any way dependent on or highly conditioned by that current would be overstating the case. Moreover, the history of the adoption of firearms suggests that military processes may have been far more central to the Qing formation than has been acknowledged, and that a critical examination of the early, preconquest Manchu state in light of some of the analytical categories brought to bear within the military-revolution debate may be relevant to a deeper understanding of the relationship between military organization, political power, and social change.

18. A report by the Korean official Yi Minhwan (1573–1649), who was captured and detained at the Manchu capital after the Sarhū battle, details the sophisticated arms production under Nurhaci. See Di Cosmo 1996: 14.

19 . A full analysis of the Manchu military would have to include several other aspects, for instance: the role and degree of integration of the Mongol troops, relationships between the aristocratic leadership and common soldiers, the specific training and function of different bodies in the army (such as the imperial bodyguards, *bayara* soldiers, and the Vanguard Regiment), organization of the production of weaponry, acquisition of financial resources for the military, and the formation and separation of distinct civil and military branches of the administration.

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CHAPTER 4

Contingent Connections: Fujian, the Empire, and the Early Modern World

John E. Wills, Jr.

What, in the World, Is a Province?

In the study of world and comparative history for early-modern times, we have come to a new appreciation of the importance of different shapes of state-building. The European pattern of territoriality, citizenship, and multiple centers of competitive, mobilizing state-building activity, sometimes called "mercantilist," is seen as building on continuities in political culture reaching back to the ancient Mediterranean. In the "gunpowder empires" of the Islamic world, which figure along with the Ming and Qing as the great early-modern "agrarian empires," growth of trade and population can be seen opening the way to inchoate regional state-building efforts that challenged the essentially control-oriented and self-limiting regimes of the imperial centers (Bayly 1988, 1989; Goldstone 1991). China under the Qing can be seen as comparable to other agrarian empires, presenting some intriguing similarities to the pattern of the gunpowder empires in social and economic

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